

APPENDIX B



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Fecralloy™ Electrical Resistance Steel[Return to last search](#)[Printer friendly version](#)[Download to Excel \(requires Excel and Windows\)](#)[Export data to your CAD/FEA program](#)

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Subcategory: Electronic/Magnetic Alloy; Ferrous Metal; Metal; Stainless Steel; Superalloy**Component Wt. %**

| | |
|----|-----|
| Al | 5.3 |
| Cr | 22 |
| Fe | 73 |

Material Notes:

Nominal iron content calculated as remainder. Yttrium addition does not appear in nominal composition. Ferritic stainless steel with aluminum. Available as wire, bar, tube, and strip. Used mainly for electrical elements in both industrial and domestic applications. Industrial applications vary from small laboratory kilns to heavy-duty heat-treatment furnaces under all types of atmospheres. "Fecralloy"*** an Fe-Cr-Al steel containing "yttrium" is a versatile alloy and is suitable for use over a wide range up to 1300°C. The "yttrium" is the key to its longer high temperature life, having greater oxidation resistance and form stability over other resistance alloys.

***"Fecralloy" is the registered trademark of the UK Atomic Energy Authority (Now AEA Technology, Harwell). Information provided by Resistalloy International Limited.

Physical Properties

| | Metric | English | Comments |
|---------|-----------|--------------|----------|
| Density | 7.15 g/cc | 0.258 lb/in³ | |

Mechanical Properties

| | | | |
|--|-----------|------------|-----------|
| Hardness, Vickers | 230 | 230 | |
| Tensile Strength, Ultimate | 750 MPa | 109000 psi | |
| Tensile Strength, Ultimate at Elevated Temperature | 37 MPa | 5370 psi | 900 |
| Tensile Strength, Yield | 550 MPa | 79800 psi | |
| Elongation at Break | 16 - 20 % | 16 - 20 % | 50 mm (2) |

Electrical Properties


| | | | |
|------------------------|------------------------|-----------------|---|
| Electrical Resistivity | <u>0.000139 ohm-cm</u> | 0.000139 ohm-cm | Temperature Factor is 1.05 at 80°C (1470°F). Temperature Factor is 1.06 at 1000°C (1830°F). Temperature Factor is 1.06 at 1200°C (2190°F) |
| Curie Temperature | <u>600 °C</u> | 1110 °F | |

Thermal Properties

| | | | |
|----------------------------------|--------------------|----------------------|---------|
| CTE, linear 20°C | <u>11 µm/m-°C</u> | 6.11 µin/in-°F | 20-25C |
| CTE, linear 250°C | <u>11 µm/m-°C</u> | 6.11 µin/in-°F | 20-25C |
| CTE, linear 500°C | <u>12 µm/m-°C</u> | 6.67 µin/in-°F | 20-50C |
| CTE, linear 1000°C | <u>15 µm/m-°C</u> | 8.33 µin/in-°F | 20-100C |
| Specific Heat Capacity | <u>0.46 J/g-°C</u> | 0.11 BTU/lb-°F | |
| Thermal Conductivity | <u>16 W/m-K</u> | 111 BTU-in/hr-ft²-°F | |
| Melting Point | <u>1500 °C</u> | 2730 °F | |
| Maximum Service Temperature, Air | <u>1400 °C</u> | 2550 °F | |

Optical Properties

| | | | |
|------------------|-----|-----|--------------|
| Emissivity (0-1) | 0.7 | 0.7 | Fully Oxidiz |
|------------------|-----|-----|--------------|

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Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.

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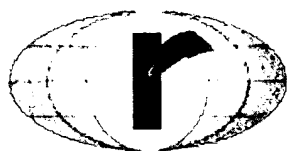
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RESISTALLOY

Resistalloy International Limited

Riverside Works, Weedon Street, Sheffield S9 2FT

Tel: (0114) 2448634 Fax: (0114) 2420902

Range of Resistance Heating Alloys (i) PHYSICAL AND MECHANICAL PROPERTIES

| Fe-C-Al alloy 1% Ferritic stainless steel with aluminium | FeCrAlloy | FeCrAlloy 145 | FeCrAlloy 155 | Resistalloy 154 |
|--|--|--|--|--|
| Form | Wire Strip Bar Tube | Wire | Wire Strip Bar | Wire Strip |
| Maximum operating temperature (element temperature in air) °C °F..... | 1400° 2550 | 1400° 2550 | 1300° 2370 | 1100° 2010 |
| Nominal composition % Cr..... | 22 | 22 | 22 | 15 |
| Al..... | 5.3 | 5.8 | 4.8 | 4.3 |
| Y..... | Addition | - | - | - |
| Fe..... | Bal | Bal | Bal | Bal |
| Density, g/cm ³ lb/in ³ | 7.15 0.259 | 7.10 0.256 | 7.25 0.262 | 7.28 0.263 |
| Electrical resistivity at 20°C Ω mm ² m ⁻¹ or 68°F Ω /cmf | 1.39 836 | 1.45 872 | 1.35 812 | 1.25 755 |
| Temperature factor of the resistivity, C | | | | |
| 600°C 1112°F | 1.04 | 1.02 | 1.04 | 1.08 |
| 800°C 1470°F | 1.05 | 1.03 | 1.06 | 1.10 |
| 1000°C 1830°F | 1.06 | 1.04 | 1.07 | 1.11 |
| 1200°C 2190°F | 1.06 | 1.04 | 1.08 | - |
| Coefficient of thermal expansion, K ⁻¹ | | | | |
| 20 - 250°C 68 - 480°F | 11 10-6 | 11 10-6 | 11 10-6 | 11 10-6 |
| 20 - 500°C 68 - 930°F | 12 10-6 | 12 10-6 | 12 10-6 | 12 10-6 |
| 20 - 750°C 68 - 1380°F | 14 10-6 | 14 10-6 | 14 10-6 | 14 10-6 |
| 20 - 1000°C 68 - 1830°F | 15 10-6 | 15 10-6 | 15 10-6 | 15 10-6 |
| Thermal conductivity at 20°C Wm ⁻¹ K ⁻¹ 68°F Bru in./ft ² h ⁻¹ °F ⁻¹ | 16 111 | 16 111 | 16 111 | 16 111 |
| Specific heat capacity, kJ kg ⁻¹ K ⁻¹ 20°C/ Bru lb ⁻¹ °F ⁻¹ , 68°F..... | 0.46 0.110 | 0.46 0.110 | 0.46 0.110 | 0.48 0.115 |
| Melting point (approx.) °C °F..... | 1500 2730 | 1500 2730 | 1500 2730 | 1500 2730 |
| Mechanical properties** (approx.) | | | | |
| Tensile strength, N mm ⁻² tsi..... | 750 48.5 | 750 48.5 | 750 48.5 | 750 48.5 |
| Yield point, N mm ⁻² tsi..... | 550 35.5 | 550 35.5 | 550 35.5 | 550 35.5 |
| Hardness (approx.) Hv..... | 230 | 230 | 230 | 230 |
| Elongation at failure (approx.) (on 50mm) %..... | 16/20 | 16/20 | 16/20 | 16/20 |
| Tensile strength at 900°C N/mm ² 1650°F tsi..... | 37 2.41 | 34 2.23 | 34 2.23 | 30 1.92 |
| Creep strength | | | | |
| at 800°C N/mm ² at 1470°F tsi..... | 8 0.52 | 6 0.39 | 6 0.39 | 4 0.26 |
| at 1000°C N/mm ² at 1830°F tsi..... | 1.5 0.096 | 1 0.065 | 1 0.065 | 1 0.060 |
| Magnetic properties..... | Magnetic (Curie point approx 600°C 1100°F) | Magnetic (Curie point approx 600°C 1100°F) | Magnetic (Curie point approx 600°C 1100°F) | Magnetic (Curie point approx 600°C 1100°F) |
| Emissivity, E, fully oxidised condition.... | 0.70 | 0.70 | 0.70 | 0.70 |

* For maximum life of an element above 1300°C, Fecralloy 145 is recommended, due to the thicker oxide layer/higher aluminium content.

** Mechanical properties based on 2.0mm wire. Finer wire below 1.0mm will exhibit up to 10% higher tensile strength, and above 5.0mm diameter slightly lower strength.

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